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An Example of Convergence: Guatemala Research on WaSH (GRoW)

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EDITORIAL

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Guatemala, the most populous country in Central America (more than 14 million people) with the largest city in Central America (Guatemala City), is also home to the most stunted population in the Western Hemisphere (prevalence of nearly 50%) and the sixth most stunted population among children under five years old globally (United States Agency for International Development (USAID), 2018). With a Gini index above 50 (i.e. a measure of statistical dispersion of wealth varying from 0, perfect equality, to 100, perfect inequality), the unequal distribution of wealth, especially the poverty of the Mayan population living in the rural Western Highlands of Guatemala, contributes to extreme stunting that affects nearly 70% of children in the highly inaccessible Departments (i.e. "States") of Huehuetenango, Quitzaltenango, Quiche, San Marcos and Totonicapan. Stunting, defined as height-for-age more than two standard deviations below the United Nations World Health Organization (UNWHO) Child Growth Standards median, results in an irreversible loss of cognitive ability and physical well-being contributing to a poverty trap where short-of-stature adults are unable to provide a better life for their children (United Nations World Health Organization, 2014).

1 | BACKGROUND

A combination of poor nutrition, repeated infection and inadequate psychosocial stimulation is believed to be the cause of stunting. And interventions to reduce, or even eliminate, stunting require a coordinated systems-based approach targeting the first 1,000 days of life—defined as the time from when a mother learns she is pregnant and until the second birthday of her child. Antenatal nutrition, perinatal healthcare, maternal hydration supporting exclusive breastfeeding, and access to clean water and safe food through age five all are important to ensure a child avoids stunting. Education, employment and adequate housing all are upstream factors that contribute to women's empowerment and support mothering best practice reducing stunting. GRoW—Guatemala Research on WaSH (i.e. water, sanitation and hygiene)—is a coordinated effort of diverse environmental health professionals designed to advance scientific understanding, pilot and scale-up interventions and disseminate sustainable solutions to eliminate the scourge of childhood stunting throughout the Western Highlands of Guatemala (Oerther, Voth-Gaeddert, & Divelbiss, 2019).

Through a community-based participatory research (CBPR) approach, GRoW welcomes co-ownership by diverse stakeholders, including: (a) academicians and evidence-based health practitioners; (b) non-governmental organizations (NGOs), government agencies and the private sector including small and medium enterprise (SME); as well as (c) individuals, families and communities. And collectively the stakeholders share responsibility for problem identification, resource mobilization and dissemination of results. As a research enterprise, GRoW employs mixed methods including interviews, data analytics and structured reviews to create confirmatory Structural Equation Models (SEMs), which are tested with additional data collected by teams of environmental health professionals trained and sustained using a modified interprofessional education (IPE) model where engineers, nurses, teachers and politicians all work together to cultivate collaborative practice and elevate environmental health, upstream and downstream.

GRoW has advanced our fundamental understanding of the causes of stunting (Voth-Gaeddert, Stoker, Cornell, & Oerther, 2018) including the interrelationship among: (a) access to clean drinking water, sanitation infrastructure and household hygiene; (b) household education level (HEL); (c) socioeconomic status (SES); and mediating mechanisms, such as, (d) environmental enteric dysfunction (EED) exacerbated by chronic exposure to low levels of aflatoxin produced by fungi contaminating local maize supplies (Voth-Gaeddert, Torres, et al., 2019). Captured in confirmatory SEMs, hypothesized causal relationships serve as the starting point for the identification and execution of local interventions meant to improve environmental health. During a decade of sustained award-winning effort (American Academy of Environmental Engineers & Scientists, 2016; Smethurst, 2019), approximately 200,000 individuals have benefited from targeted local interventions that range from point of use (POU) drinking water filters (Divelbiss, Boccelli, Succop, & Oerther, 2013) to education on how to identify fungal contamination of maize and the importance of reducing dietary exposure to aflatoxin (Voth-Gaeddert, Stoker, Torres, & Oerther, 2019). And the approach developed for GRoW—integrating CBPR, mixed methods (including interviews, data analytics and structured reviews), *SEM* and IPE—has been demonstrated successfully to intervene in diarrhoeal illness in Brazil (Voth-Gaeddert, Cudney, & Oerther, 2018) and child stunting in South Africa (Voth-Gaeddert et al., in review).

2 | CONVERGENCE RESEARCH

GRoW is an example of "convergence research", which has been defined by the United States National Science Foundation (NSF) as: "a means of solving vexing research problems, in particular, complex problems focusing on societal needs. It [convergence research] entails integrating knowledge, methods and expertise from different disciplines and forming novel frameworks to catalyse scientific discovery and innovation" (Tornow et al., 2018). In 2016, convergence research was identified as one of 10 big ideas for future NSF funding. Convergence research was an output of the 2015, Art and Science, Engineering and Medicine Frontier Collaborations: Ideation, Translation and Realization, conference hosted by the Keck Futures Initiative of the United States National Academies of Science, Engineering and Medicine (National Research Council, 2016). The goals of the NAKFI conference included: stimulating a renaissance of innovation to solve real-world problems; collaborating among disciplines and with the public to encourage discourse on important issues; and exploring the use of creative disruption and the aesthetic experience to engage and stimulate the creativity of the human mind. Convergence research aims to solve a specific and compelling problem—a deep scientific question or pressing social need; and convergence research demands deep integration across disciplines—what has been termed "transdisciplinary" collaboration.

Convergence research is what is needed to address the grand challenges to health care for the next decade, including: preparing for and responding to outbreaks of emerging and re-emerging disease; control of non-communicable disease (NCD); protecting and restoring environmental health; reversing the spread of antimicrobial resistance (AMR); and improving education and training—especially the shortfall of nurses and midwives (Chan, 2017). But to address these specific and compelling problems of health care, it is critical that a transdisciplinary mindset be adopted. Nurses can no longer afford to share the narrow view that the healthcare profession solely consists of physicians, podiatrists, dentists, chiropractors, psychologists, optometrists, nurse practitioners, nurse-midwives and clinical social workers (United States Government Publishing Office, 2011). To succeed at convergence research, the example used in GRoW—where engineers, nurses, teachers and politicians all work together to cultivate collaborative practice and elevate environmental health—must to be taken to heart. Convergence only solves pressing societal challenges when transdisciplinarity is adopted.

3 | NURSING INPUT

Leveraging the leadership of Sigma Theta Tau and the Global Advisory Panel on the Future of Nursing and Midwifery: Bridging the Gaps for Health (Sigma Theta Tau International, 2017), in the USA nurses have an opportunity to redefine the term "healthcare professional" as part of the Future of Nursing 2020–2030: A Consensus Study from the National Academy of Medicine. Nurses should partner with others who can help to share some of the burden of improving the environment to promote wellness and achieve health (Oerther, 2019). One natural partner for nurses would be professionals who already use many of the same skills and tools in the STEM (i.e. science, technology, engineering and math) disciplines who need to learn empathy and caring from the profession of nursing (Oerther, 2018). Ultimately, "STEMpathy" approaches that bridge the artificial disciplinary divide among evidence-based practitioners, such as nurses and engineers, offer the greatest promise to achieve convergence and solve the grand challenges of health care (Oerther, 2017).

CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

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